FAA National Software Conference, June 2001
Previously Developed Software

PREVIOUSLY DEVELOPED SOFTWARE

FAA SOFTWARE
STANDARDIZATION CONFERENCE

Boston, Massachusetts.

June 5-7, 2001

Jorge Castillo - FAA/ASW-110

"Guidelines For Applying DO-178B Level D Criteria To Previously Developed Software (PDS)" Notice N8110.82/92

N8110.92

FAA National Software Conference, June 2001
Previously Developed Software

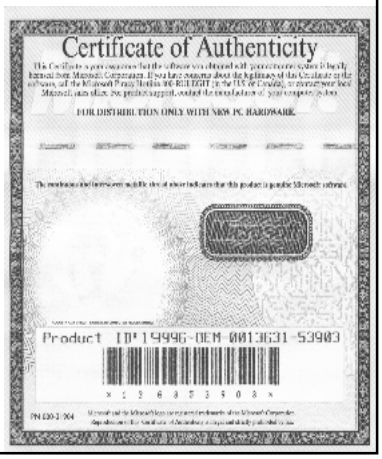
Purpose & History

- **PURPOSE:**
  - **To Give Guidelines For Meeting DO-178B Level D Objectives For PDS**
- **HISTORY:**
  - **Began When Applicant Desired To Use Windows NT in Airborne Equipment**
  - **PDS Is Big Issue For Industry**
  - **Notice Routed For Comment Sept 1998**
  - **Notice 8110.82 Signed March 1999**
  - **Notice 8110.82 Changed to 8110.92 on Nov. 2000**

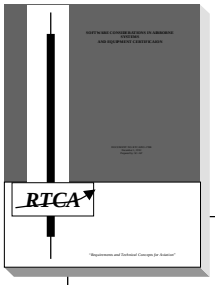
N8110.92

Technical Information: What Is PDS?

- **Software that was not developed using DO-178B**
  - **Commercial-off-the-shelf**
  - **Military Standards**
  - **Other Industry Standards**
  - **DO-178 or DO-178A**
  - **etc.**

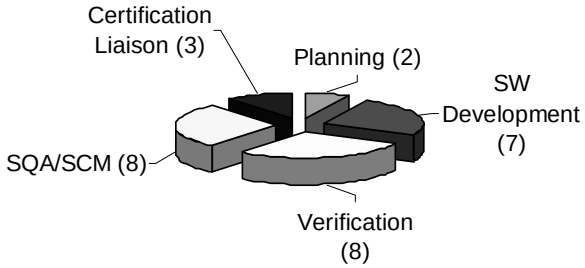


Previously Developed Software



Technical Info: Level D Objectives - 1/7

28 Level D Objectives



N8110.92

Technical Info: Level D Objectives - 2/7

- Two Planning Objectives: 1-1, 1-4
- There Must Be a Plan (per 1-1)
  - Don't Evaluate Quality of Plan (1-6)
  - Plan May Not Meet DO-178B (1-6)
- Plan Must Be Followed (9-1)
- Additional Considerations Should Be In The Plan (1-4)
  - Magic
  - Service Experience

N8110.92

Technical Info: Level D Objectives - 3/7

- Eight SQA/SCM Objectives
  - Plan Was Carried Out
  - Product Configuration Is Identified, Protected, And Explained
  - What Is Approved Is What Is Flying

N8110.92

Technical Info: Level D Objectives - 4/7

- Three Certification Liaison Objectives:
  - Cert Authority Agreement Up Front
  - Data In Place To Prove:
    - Plan Was Followed
    - DO-178B Objectives Were Met

N8110.92

Technical Info: Level D Objectives - 5/7

- Eight Verification Objectives
  - Six Concentrate on Functional Testing
    - High Level Req Good & Trace to Sys Req
    - Executable Complies and Is Robust With High Level Req
  - One Verifies Behavior of Object Code in Target Environment
    - Executable Code Compatible w/ Target Computer
  - One Verifies That Partitioning Is Not Compromised

N8110.92

Technical Info: Level D Objectives - 6/7

- Seven Development Objectives:Table A-2
  - 2-1: High Level Req Developed
  - 2-2: Derived High Level Req Are Defined
  - 2-3, 2-4, 2-5: SW Architecture/Low Level Req Are Developed
    - ... From High Level Req
    - No Verification Objectives Cover This

N8110.92

Technical Info: Level D Objectives - 7/7

- Seven Development Objectives (cont)
  - 2-6: Source Code Is Developed
    - ... Traceable to and Conforms with Low Level Req
    - No Verification Objectives Cover This
  - 2-7: Object Code is Produced and Executes in Target Computer
    - No Verification Objectives Cover This
    - High Level Req Testing Subsumes This

N8110.92

Notice Outline

- 7 Sections:
  - Section 1: Purpose
  - Section 2: Distribution
  - Section 3: Related Publications
  - Section 4: Background
  - Section 5: Discussion
  - Section 6: Procedures
  - Section 7: Conclusion

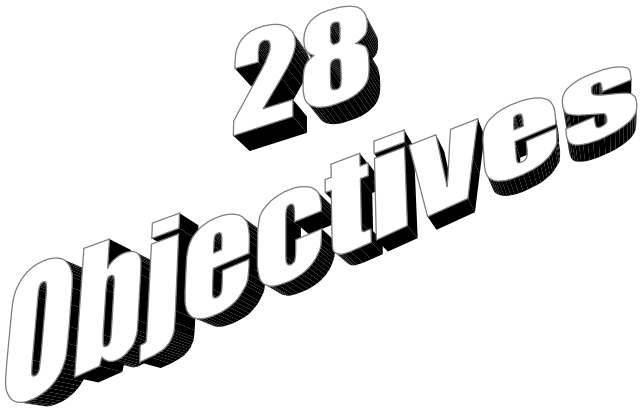
N8110.92

Background (Section 4) - 1/2

- Level D to Address a Minor Aircraft Failure Condition
- Level D Intended to Provide a Thorough Investigation of the Functional Behavior of the Software
- Level D Intended to Provide the Necessary Configuration Control

N8110.92

Background (Section 4) - 2/2



N8110.92

Discussion (Section 5)

5 Confusing Objectives

1-1, 2-3, 2-4, 2-5, 2-6

N8110.92

Objective 1-1 (Section 5a)

- 1-1, "Software Development and Integral Processes Activities are Defined," Req'd for Level D
- 1-6, "Software Plans comply with this document," Not Req'd For Level D
- Interpretation:
  - There Must Be Plans (1-1)
  - Plans Should Assure SW Meets DO-178B Objectives
  - Plans Must Be Followed (9-1)

N8110.92

Previously Developed Software

Objective 2-4 (Section 5b)

- 2-4: "Low-level Requirements Are Developed"
- Intent: Design Is Defined
- No Explicit Verification of Low Level Req or Architecture In Table A-4
- 2-4 Is Implicitly Satisfied By 6-1 & 6-2
- No Need To Assure Low Level to High Level Req Traceability for Level D PDS

N8110.92

Objective 2-3 (Section 5c)

- 2-3: "Software Architecture Is Developed"
- Same Logic As Objective 2-4
- No Explicit Verification Activities
- Implicitly Satisfied By Other Objectives
  - I.e., 4-8 through 4-12

N8110.92

Previously Developed Software

Objective 2-5 (Section 5d)

- 2-5: "Derived Low-Level Requirements Are Defined"
- No Explicit Verification of Derived Low-Level Requirements
- Implicitly Satisfied By Meeting Objective 2-2 and Associated Verification of High Level Requirements

N8110.92

Objective 2-6 (Section 5e)

- 2-6: "Source Code Is Developed"
- No Explicit Verification of Source Code In Table A-5
- Need: Exe Code to High Level Req Traceability
- Don't Need: Source Code to Low-Level Req to High-Level Req Traceability
- Interpretation: Exe Code to Meet All Functional Verification Requirements By Other Objectives

N8110.92

Previously Developed Software

Procedures (Section 6)

- a) Table A-2, objectives 3,4,5,6 are Implicitly Covered by Other Objectives
- b) Partitioning/Protection for Systems with Multiple Function
- c) May Need to Limit Software Level for PDS in Systems with Multiple Functions

N8110.92

Example - 1/4

- A Company Recently Received A TSO Approval On A System Using Windows NT
- The System Was A Level C Moving Map/ Navigation Device
- However, Windows NT Was Only Approved To Level D
- Required Protection Between System (Level C) And Windows NT (Level D)
- Windows NT Was Shown To Provide Only a Minor Failure Condition

N8110.92

Example - 2 / 4

- **Protection Argument Required Applicant To Demonstrate:**
  - **No Failure of Windows NT Can Contribute to Anything Greater Than a Minor Hazard**

    OR
  - **No Failure of NT Can Affect Other Programs**

N8110.92

Example - 3 / 4

- **Three Choices For Windows NT Approval To Level D**
  - **Meet Objectives for Level D**
  - **Sublimate as Part of Architecture**
  - **Service Experience**

N8110.92

Example - 4/4

- **SUMMARY OF EXAMPLE:**
  - **Moving Map/Navigation Device - Can Produce a Major Hazard**
  - **Windows NT Was Shown to Produce Only a Minor Failure Condition**
    - **By Considering Loss of Function vs Corruption of Function**
    - **By Converting all Windows NT Problems to Loss of Function**
  - **Windows NT is N O T Level C**

N8110.92

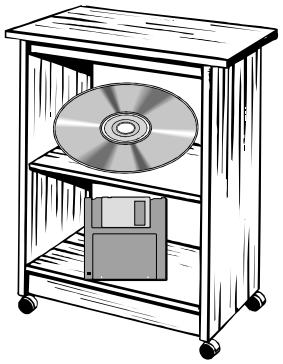
SC-190/WG-52's Activities

- **SC-190/WG-52 Addressing PDS**
  - **Started As: "COTS" Sub-group**
  - **Became: "PDS" Sub-group**
  - **Now: "Development" Sub-group**
- **Writing Frequently Asked Questions (FAQs) and Position Papers To Clarify DO-178B**

N8110.92

COTS Research Project

- AIR-130 Sponsoring a Research Project On COTS Hardware and Software
- Goals: Develop Criteria And Tutorial For COTS Use In Aviation Systems



N8110.92